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AGRICULTURAL MEMORANDUM No 572

EFFECTS OF SUNSHINE ON PIG DEATHS IN TRANSIT

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The data referred to in Agricultural Memorandum No 565 was further analysed in the style of Agricultural Memorandum No 568. The results are shown in Appendices I and II.

Comparison of the mean daily sunshine for days with and without deaths in transit, and for days with no deaths at all, for each degree range of temperature (Appendix I), indicated no consistent relationship between incident sunshine and death rate. T-tests showed the differences in mean sunshine for days with and without deaths in transit, for the temperatures 14°C (Jan-July) and 11°C (Aug-Dec) to be significant, but this merely indicates the effects of other factors, not allowed for. Numbers dead in pens were ignored throughout, as the pens are within buildings and not subject to sunshine influence, except as a delayed stress factor.

The analysis of data for temperatures above 15°C for the Jan-July period 1961-72, which accounts for the pig deaths in transit, per 1000 transported, suggested a positive correlation between sunshine and death rate. It should be noted that the values of death rates for 15 hrs sunshine, were omitted from the calculation of the correlation coefficients, since the totals transported were low and not accurately comparable. However no firm conclusions could be drawn from these results since the total numbers of pigs transported, per hour of sunshine, for each overlapping triplet of temperature, were variable and not strictly comparable.

In an attempt to allow for this the data was grouped in categories 0-2, 3-5, 6-8, 9-11, 12-15 hrs sunshine, within each temperature range. The mean sunshine, weighted in accordance with the numbers transported, and the mean death rate were calculated for each group. In this way a more meaningful correlation coefficient was obtained for each temperature unit. The results are represented in Appendix III. The strong positive correlation between sunshine and death rate between 17°C-21°C suggests that increase in sunshine, increases the effects of temperature on likelihood of death over this temperature range. Small sample numbers at temperatures above 21°C may well mask this effect at warmer levels, if it still exists.

It is interesting that incident sunshine only appears to become effective in increasing the death risk, at the point in the temperature range where the risk begins to increase rapidly with temperature.

Any comments or suggestions on this paper should be referred to the author.

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Appendix I

TEMP °C	JAN-JULY 1961-72					
	Occasions			Mean daily sunshine (hrs)		
	Deaths in transit	No deaths in transit	No deaths	Deaths in transit	No deaths in transit	No deaths
-4	1	2	2	5.4	-	-
-3	2	5	4	5.0	1.6	1.9
-2	3	6	3	3.6	3.6	2.2
-1	7	13	10	1.0	3.4	3.9
0	11	21	16	1.9	1.8	1.5
1	19	33	21	3.2	2.1	2.2
2	15	43	26	2.4	2.9	2.9
3	31	42	22	1.9	1.9	1.5
4	36	71	46	1.4	2.5	2.4
5	41	70	44	2.7	2.5	2.5
6	31	73	44	3.1	3.3	3.3
7	40	70	42	2.4	3.1	3.3
8	53	94	67	3.0	3.1	3.0
9	54	79	55	3.5	3.0	2.9
10	53	71	46	3.5	3.6	3.7
11	49	76	51	4.8	4.3	4.2
12	53	61	39	5.2	5.2	5.5
13	54	63	33	6.4	6.4	6.3
14	54	57	32	6.3	6.1	5.7
15	58	48	33	6.6	6.0	6.6
16	79	44	32	6.4	6.7	6.6
17	72	37	22	6.8	5.3	5.5
18	56	31	18	8.1	6.3	6.0
19	43	24	17	7.0	7.9	6.5

TEMP °C	AUG-DEC 1961-72					
	Occasions			Mean daily sunshine (hrs)		
	Deaths in transit	No deaths in transit	No deaths	Deaths in transit	No deaths in transit	No deaths
-2	1	3	1	-	-	-
-1	2	5	4	6.3	2.4	3.0
0	-	16	11	-	1.3	1.4
1	7	17	9	1.2	2.6	2.6
2	6	26	17	1.5	1.3	2.6
3	12	22	16	1.3	1.3	0.9
4	17	35	26	1.7	1.9	1.8
5	16	36	23	3.3	1.4	1.5
6	24	37	23	2.6	1.9	1.5
7	30	62	37	2.0	2.4	2.5
8	33	41	26	2.7	1.7	1.9
9	29	40	25	2.6	1.4	1.4
10	31	44	30	2.0	2.3	2.3
11	24	51	32	4.4	2.4	2.5
12	51	50	27	3.2	3.9	3.9
13	56	47	33	3.0	3.3	3.4
14	52	70	41	4.8	4.8	5.3
15	68	67	42	4.5	3.4	3.6
16	77	50	36	4.4	5.2	5.1
17	61	45	29	4.7	4.9	4.3
18	43	32	14	6.1	4.9	4.2
19	32	18	12	6.6	5.9	5.6

Appendix II

MEAN DAILY SUNSHINE (hrs)	TEMP °C	Pig deaths on arrival per 1000 transported Jan-July 1961-72							
		15-17	16-18	17-19	18-20	19-21	20-22	21-23	22-24
0		0.59	0.67	0.79	1.00	1.15	1.08	1.27	-
1		0.41	0.58	0.62	0.75	0.71	0.98	-	-
2		0.64	0.66	0.69	0.72	1.22	1.72	2.84	-
3		0.65	0.72	0.81	0.89	0.56	0.51	0.00	-
4		0.87	1.03	0.90	0.89	1.49	1.76	-	-
5		0.81	1.22	1.18	1.21	0.41	1.85	2.68	2.68
6		0.61	0.68	0.93	0.81	0.79	0.57	0.63	0.38
7		0.97	1.11	1.30	1.14	1.19	1.18	0.67	0.00
8		0.79	1.03	0.55	1.31	1.59	2.02	1.37	1.33
9		1.37	1.29	1.43	0.95	1.14	1.03	1.39	1.59
10		0.60	0.64	0.70	1.44	1.88	1.88	1.16	1.04
11		0.73	0.72	1.04	1.19	1.63	1.11	1.56	1.92
12		0.68	1.01	1.43	1.54	1.71	1.71	2.28	3.07
13		1.01	1.06	1.15	1.36	0.70	1.06	1.13	5.38
14		0.72	1.01	1.32	1.56	1.85	2.01	2.00	-
15		0.50	0.00	0.00	0.00	0.00	0.00	0.00	-
Correlation sunshine/ death rate		0.22	0.43	0.59	0.85	0.50	0.30	-0.10	0.63

Appendix III

TEMP °C	Weighted sunshine	Total number of pigs transported	Death rate	Correlation sunshine/death rate
15-17	0.85 4.02 7.03 10.11 13.15	171902 154526 113115 88431 86952	0.56 0.79 0.81 0.89 0.79	0.22
16-18	0.91 4.12 7.09 10.14 13.01	152740 154117 88989 81364 100858	0.64 1.02 0.99 0.87 0.99	0.56
17-19	1.05 4.27 7.00 10.27 12.92	116139 115054 67292 65728 88972	0.71 1.02 0.99 1.06 1.33	0.92
18-20	1.41 4.33 7.07 10.28 12.75	63253 69262 53087 52316 74993	0.82 1.07 1.11 1.22 1.51	0.96
19-21	1.02 4.27 6.97 10.03 12.78	42292 25712 50079 40092 62513	1.09 0.78 1.18 1.52 1.58	0.82
20-22	2.60 6.97 9.67 12.75	26717 35629 33516 37391	1.46 1.23 1.40 1.66	0.47
21-23	2.30 6.74 9.34 12.94	13880 19844 34378 22165	2.01 0.81 1.34 1.89	-0.04
22-24	5.00 6.93 9.95 12.60	4855 5853 22081 7394	2.68 0.68 1.40 4.46	0.52